Knowledge, Perceptions and Environmental Concerns of Student Against Metal Factory Waste Pollutants at State Junior High School 1 Ceper, Klaten Regency, Indonesia

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ABSTRACT
Environmental pollution from industrial metal waste is hazardous for human survival, so knowledge, perceptions, and attitudes of caring for the environment must be formed early. The formation of knowledge, perceptions, and attitudes to care for the environment can be done through education. This study aims to determine the level of expertise, environmental care attitudes, and the relationship between knowledge, perceptions, and environmental care attitudes of students of State Junior High School 1 of Ceper in dealing with waste pollutant disasters. The sample in this study were students of State Junior High School 1 of Ceper who lived around a metal foundry factory in Ceper District. The data analysis technique used is descriptive and inferential statistics. Descriptive statistics are used to analyze the level of knowledge, perceptions, and attitudes of environmental care. In contrast, inferential statistics determine the relationship between the level of knowledge, perceptions, and attitudes of caring for the environment. The results of data analysis showed that the level of knowledge, perceptions, and attitudes of students' environmental care was high. Furthermore, the results of the Mann-Whitney test value Asymp.Sig. (2-tailed) of 0.000 less than 0.05 where the hypothesis is accepted, and it can be said that there is a relationship between knowledge, perception, and attitude of caring for the environment

Keywords: Knowledge, Perception, Environmental Care Attitude, Metal Factory Waste

1. INTRODUCTION

Indonesia has many industries in the metal sector, but the industrial management method generally still uses traditional methods so that it has the potential to cause pollution (Gunawan, dan Hadi, 2015). The metal casting industry has a huge role in environmental pollution. The waste materials produced by the metal industry are primarily in the form of dust, smoke, and gases that pollute the air. Polluted air can interfere with the health of both workers and the community around the factory (Nasir, 2011). According to (Supraptini, 2002), the negative impacts of dust, smoke, and gas waste on human health are: 1) Dust can interfere with breathing, and if it is toxic (containing Pb), it can cause neurological disorders, respiratory tract and cause anemia. Asbestos fibers can cause cancer. 2) Smoke can interfere with vision and breathing. 3) Toxic gas containing CO which can cause impaired brain function.

Along with the development of time and the number of human activities, environmental damage will tend to have a negative impact which causes a high number of occurrences and intensity of disasters [2]. Pollution of dust, smoke, and gas will have long-term impacts locally and globally. For example, the greenhouse effect is the increase in the earth's temperature due to increased levels of CO2 in the air, the depletion of the ozone layer. In addition, excessive global warming of greenhouse gases can have direct effects such as deaths from heat waves such as those that have occurred in Greece and India and can increase skin cancer and cataracts (Supraptini, 2002). To minimize environmental pollution and the negative impacts caused by the metal casting industry, the education sector has an essential function in disaster management efforts. In reducing the effects of disasters, there must be public awareness that needs to be changed to increase it through the knowledge possessed [3]. Disaster management strategies can work effectively and well if the community knows disaster management and mitigation (Sudarsono, 2017). Disaster risk reduction

efforts are the concept and practice of reducing disaster risk through systematic efforts to analyze and reduce the factors that cause disasters [5].

Many potential hazards are a challenge that must be considered by both the government and the surrounding community [6]. Along with the enormous potential for environmental pollution, knowledge and preparedness for disasters are essential for people living in disaster-prone areas [7]. The rapid development of the industry can cause environmental pollution if factory waste is not treated correctly. In industrial development, it is necessary to pay attention to the dangers that will arise, such as exposure to lead (Pb), because the heavy metal has a potential industrial impact on health [8]. One of them is the industry in Ceper District, Klaten Regency. Ceper District has many industries that have the potential to cause environmental pollution. Based on BPS, 2019 the number of industries in Ceper District is presented in Table 1.

Table 1. Number of Industry in Klaten Regency

District	Units
Prambanan	65
Gantiwarno	80
Wedi	156
Bayat	141
Cawas	150
Trucuk	242
Kalikotes	93
Kebonarum	69
Jogonalan	178
Manisrenggo	113
Karangnongko	68
Ngawen	150
Ceper	251
Pedan	99
Karangdowo	93
Juwiring	168
Wonosari	150
Delanggu	75
Polhanharjo	105
Karanganom	141
Tulung	61
Jatinom	76
Kemalang	82
Klaten Selatan	151
Klaten Tengah	136
Klaten Utara	101
Total	**3194**

Source**:** [9]

Pollutants from factory emissions carried by the wind can lead to polluted soil, and dust from factories also sticks to buildings and plants. Furthermore, several previous studies have stated that, on average, factory emissions are collected in the soil that migrates to the water system; if heavy metal waste is contained in the ground, residents who live or carry out activities in the factory environment will be exposed to pollutants in the form of metals that have high levels [10]. The liquid waste in the soil will cause groundwater pollution, which is already contaminated, causing groundwater to contain chemical substances (rust water). The metal foundry industry produces liquid waste containing heavy metals, so to minimize the danger of liquid waste, it should be treated before being discharged into the river to reduce the metal content [11]. The existence of waste generated will impact all aspects, so mitigation and recovery efforts must be carried out to minimize the impact [12]. Environmental education is needed to create a community that cares about the environment. Environmental education provided will run more optimally if it starts from early childhood by learning media [13].
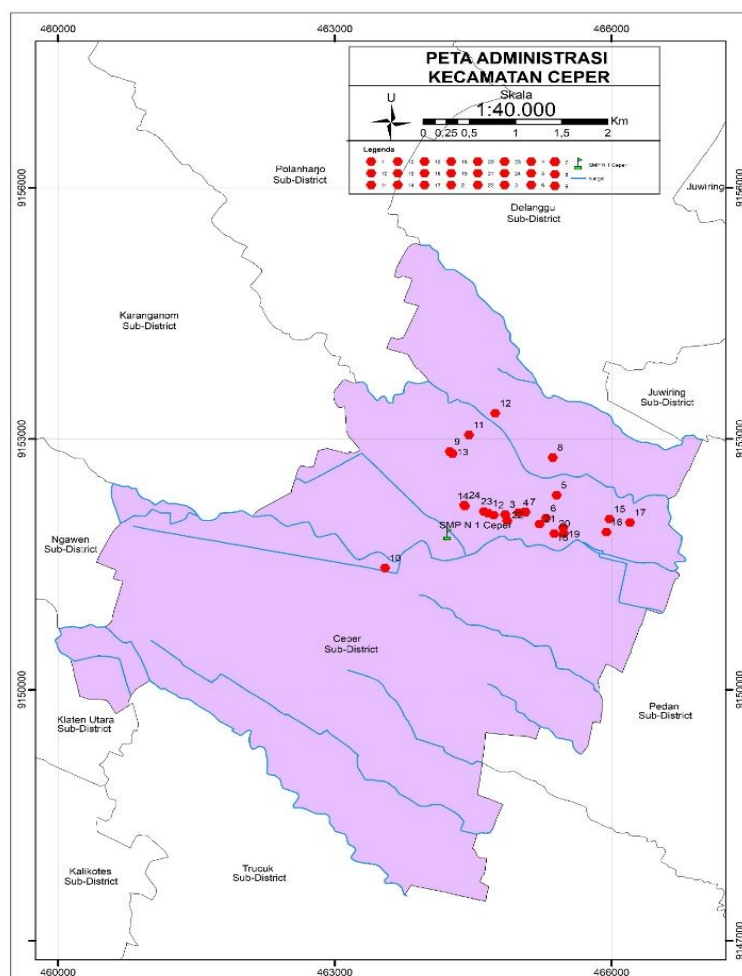
Education is one of the media to reduce disaster risk effectively. It can be done by providing teaching materials in learning about natural and non-natural disasters. Teaching materials can be required for all students at all levels, especially for schools located in disaster-prone environments, which aim to create a generation that is disaster-resilient [14]. Schools must be able to provide broad knowledge for students to deal with disasters, teachers must also be able to provide support to students in responding to disasters [3]. Disaster education is expected to increase students' knowledge and skills in disaster response.

Schools play a significant role in prevention efforts in the early stages of disaster mitigation. In addition, teachers have a great responsibility to guide, educate students to develop learning and life skills in their interactions at school (Syarif, 2015). It is widely recognized that education plays a vital role in reducing disasters and achieving human security to achieve sustainable development [16]. Considering the existence of disaster risk, awareness and strengthening regarding disaster risk reduction are needed. It can be done through disaster preparedness education in schools by establishing a Disaster Preparedness School [17]. Students can be creative, active, and proactive, which is needed to develop a disaster-safe culture to mitigate disasters in the long term. Building a disaster-safe culture is not easy because it requires a cognitive and psychomotor learning process [18]. One important area for improving disaster response and emergency management is the use of information and communication technology [19].

State Junior High School 1 of Ceper is located in Karangmojo Village, Ceper District, Klaten Regency. Metal factories in Ceper District are generally found in several villages not far from State Junior High School 1 of Ceper. The average distance between State Junior High School 1 of Ceper and the foundry factory is 200-300 meters. Most of these junior high school students live in metal factory areas, so students of State Junior High School 1 of Ceper will better understand the impacts

caused by metal casting factories. Therefore, this study focuses on analyzing the knowledge, perceptions, and attitudes of environmental care of students towards metal factory waste pollutants in Ceper District, Klaten Regency. The results of this study are expected to be used as a basis for planning disaster-safe schools in Ceper District.

Figure 1 Schools At Ceper Subdistrict

2. METHOD

This type of research is descriptive quantitative research. This research focuses on the level of knowledge, perceptions, and attitudes of environmental care students of State Junior High School 1 of Ceper. The method used in this study is quantitative because the results of observations are converted into numbers. Therefore, they can use statistical techniques to analyze the results of the data that has been obtained; quantitative data is data in the form of numbers whose results are in the form of scoring [20]. The design in this study uses survey research. Survey research is an approach usually for collecting more considerable amounts of data. The data is from samples taken from the population. In this survey, the research design aims to understand general information from the people and collect data from opinions from several people regarding the issue at hand [21].

This study's data collection techniques were observation techniques and questionnaire techniques. The indicators in this study consisted of students' knowledge, perceptions, and environmental care attitudes. Data collection instruments must be tested for validity and reliability before distributing to respondents. To test the validity and rehabilitation of the device, you can use the Product Moment Correlation formula (r). To test the significance of the correlation coefficient, the results must be consulted with the Product Moment r table. Before consulting the table r, it is necessary to calculate the degrees of freedom.

The population in this study were all students of State Junior High School 1 of Ceper, Klaten Regency. The sample was determined based on the student's house around the metal foundry factory in Ceper District. In selecting the model or respondent, the researcher used the purposive sampling technique. The variables in the study are research targets that have a variety of values were from something that is a symptom of

research; the sign in question is something that is the target of investigation (Nasution, 2017). Research variables are divided into two main categories: independent and dependent variables. The independent variables in this study are students' knowledge, and perceptions and the dependent variable in this study are students' environmental care attitudes.
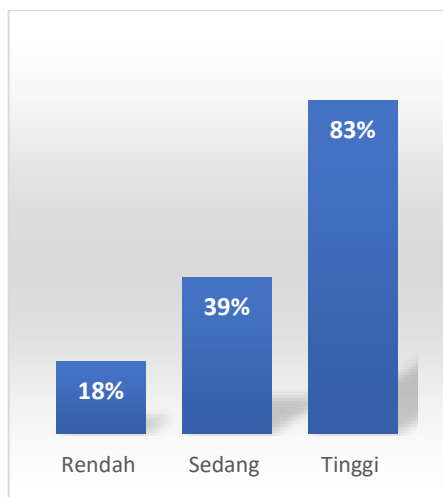
The method for data analysis is a prerequisite test using parametric and non-parametric statistics. The prerequisite test determines which test statistic is needed, so it must be carried out with normality and homogeneity tests to find out the results using parametric or non-parametric statistics. The next stage is to determine whether the data in the study is homogeneous and normally distributed or not. The data in this study were not homogeneous and not normally distributed. The conditions were not met, so using non-parametric statistical analysis through the t-test (Independent sample t-test) and the Mann Whitney test. The statistical method of the relationship used the non-parametric Mann-Whitney test.
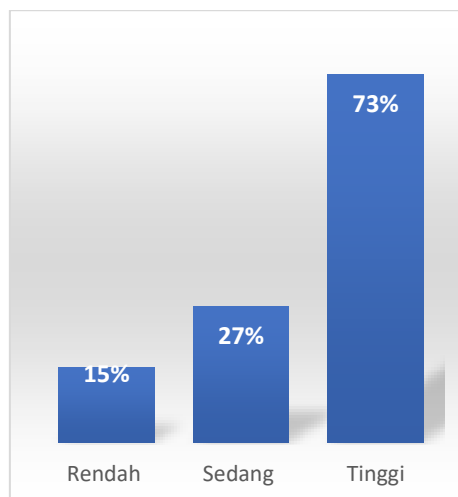
3. RESULT AND DISCUSSION

3.1. Result

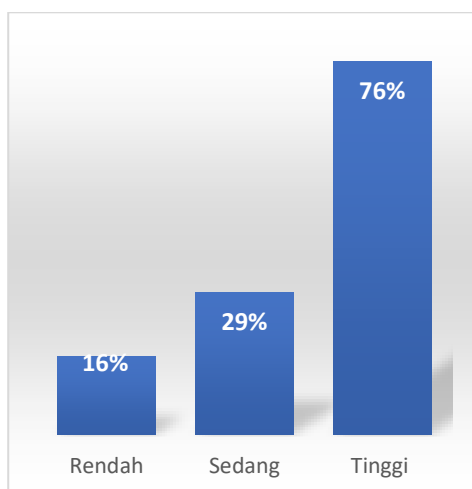#### *3.1.1 Data of Normality Test*

The result data of Knowledge Level, Perception, and Environmental Care Attitude can be presented in Figures 2, 3, 4. The level of knowledge about metal factory waste included in the high category is 83%, the medium type is 39%, and the low category is 18% (Fig. 2). The level of perception of metal factory waste included in the high category is 73%, the medium category is 27%, and the low category is 15% (Figure 3). Environmental care attitudes regarding metal factory waste are in the high category totaling 76%, 29% in the medium category, and 16% in the low category (Figure 4). From the normality test results in the Table 2, based on a significance value of 0.000, meaning that the value is less than 0.05, it can be concluded that the residual value is not normally distributed.

Figure 2. Student Knowledge Level

Figure 3. Students' Perception

Figure 4. Students' Environmental Care

Table 2. Normality Test Results with Kolmogorov-Smirnov

		Unstandardized Residual
N		137
Normal Parameters	Mean	.0000000
	Std. Deviation	.58404845
Most Extreme Differences	Absolute	.472
	Positive	.279
	Negative	-.472
Kolmogorov-Smirnov Z		5.524
Asymp. Sig. (2-tailed)		.000

Source : SPSS data processing results, 2018

3.1.2. Data Homogeneity Test

From the results of the homogeneity test in the table above, based on the F value of 1.295, meaning that the value is less than the F value of Table 3.89, it can be concluded that the data is homogeneous.

Table 3. Homogeneity Test Results

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	37982.029	1	37982.029	1.295	.000
Within Groups	798.029	272	2.934		
Total	38780.058	273			

Source : SPSS data processing results, 2018

3.1.3. Data Hypothesis testing

After the Normality and Homogeneity test was carried out, data analysis was conducted to test the proposed hypothesis. This test was carried out to determine whether there was a relationship between students' knowledge and environmental care attitudes regarding the impact of metal factory waste in Ceper District. The results of the Mann-Whitney test can be seen in Table 4.

Table 4. Hypothesis Test Results (Mann-Whitney U)

	Respondent Result
Mann-Whitney U	.000
Wilcoxon W	9453.000
Z	-14.908
Asymp. Sig. (2-tailed)	.000

Source : SPSS data processing results, 2018

Based on Table 4, it is known that the value of Asymp.Sig. (2-tailed) of 0.000 is less than 0.05. So it can be concluded that the hypothesis is accepted. It can be said that there is a relationship between knowledge and environmental care attitudes of students regarding the impact of metal factory waste.

3.2. Discussion

3.2.1. Students Knowledge Level

Based on the research results above, there are ratios of several parameters, including the characteristics of the respondents and the gender of the students. The results of data analysis on the level of knowledge regarding pollution, the environment, impacts, and countermeasures are seen from the questionnaire results at State Junior High School 1 of Ceper. Students who live in metal factory areas show a high level of knowledge. Factors of awareness to protect the environment include expertise, technology development, and the waste management model. The level of expertise can affect preserving the environment, especially the management of industrial metal waste in Ceper District. Education is a determining factor in thinking and understanding in carrying out environmental protection activities, so students have a very important role in maintaining and understanding the good impacts produced after carrying out environmental protection activities. The higher the level

of student knowledge, the greater the possibility of good behavior.

Knowledge is the result of one's knowledge of objects through their senses. Several factors can affect knowledge, including education, age, interests, experience, habits of the surrounding environment, and information. The students in this study had an age range of 13-14 years and the same education. Age is one of the factors that affect the level of knowledge. Along with increasing age, a person will experience physical and psychological development, for example, psychological growth where a person's way of thinking will be more mature. With increasing age, the knowledge about the dangers of metal factory waste will increase.

In this study, students' knowledge of metal factory waste was collected through questionnaires, namely knowledge of pollution, knowledge of the environment, understanding of impact, and prevention. In the aspect of student knowledge indicators related to the level of knowledge of metal factory waste, it is considered good. Judging from the graph results that in the level of knowledge about metal factory waste, there are the level of knowledge about metal factory waste included in the high category is 83%, the medium type is 39%, and the low category is 18%. Students know about environmental pollution, its impact, and overcoming or preventing metal factory waste pollution.

3.2.2. Students Perception

Based on the data analysis, in the level of perception of metal factory waste included in the high category is 73%, the medium category is 27%, and the low category is 15%. Education is a determining factor in thinking and understanding environmental protection activities. Students have a critical role in maintaining and understanding the good impacts generated after environmental protection activities because schools are the right place to implement character education. Student perception is something that happens to each individual. The individual's perception is influenced by internal and external factors or environmental factors.

Students' perceptions of the environment about metal factory waste were collected through a questionnaire. Respondents tried to give their opinion about the importance of protecting the environment. In the aspect of indicators, students' perceptions of metal factory waste are considered good. Students argue about environmental pollution, impacts, and overcoming or preventing metal factory waste pollution. Students' positive perceptions indicate that the higher the level of knowledge, the fewer negative impacts caused by industrial metal waste.

3.2.3. Environmental Care

Based on the results of data analysis environmental care attitudes regarding metal factory waste are in the high category totaling 76%, 29% in the medium category, and 16% in the low category. One of the elements needed to be able to do something is knowledge. If we want something and can be done continuously, positive knowledge is required about what to do. In other words, attitudes or actions based on knowledge will longer duration than actions without expertise. The higher a person's level of expertise, the higher the awareness to protect the environment. The more students who have a positive attitude, the more they will take action, but on the contrary, if the greater the number of negative students, the more they will not take action. Therefore, to realize an attitude of caring for the environment must be based on knowledge. It is in line with research [22], which argues that students who come from schools located in disaster-prone areas are likely to have a higher level of knowledge, as students often know about the threat of disasters in those areas.

One of the efforts to overcome environmental problems can be by forming environmental care characters from an early age. The process of understanding and awareness of each student regarding the importance of protecting the surrounding environment can be started through education because schools are the right place to implement character education. Students' environmental care attitudes about metal factory waste were collected through a questionnaire regarding environmental care attitudes in this study. In the aspect of the ecological care attitude indicator shown by the researcher, it shows that respondents try to understand the importance of protecting the environment, namely trying to invite other people around to protect and preserve the environment directly or in writing.

3.2.4. Relationship of Knowledge, Perception and Attitude of Caring for the Environment of Students

Based on the calculation results of the Mann-Whitney test, the value of Asymp.Sig. (2-tailed) of 0.000 less than 0.05 where the hypothesis is accepted, and it can be said that there is a relationship between knowledge, perception, and attitude of caring for the environment. The results of these calculations obtained a reasonably high relationship between knowledge, perception, and environmental care attitude of students in metal factory waste disaster management.

It is because students with high knowledge and perceptions are likely to do or take a positive attitude. So a person's attitude or behavior depends on each person and the level of expertise they have. In addition, students also think that there are benefits in dealing with metal factory waste disasters. In this study, there is a relationship between the level of knowledge, perception, and attitude of caring for the environment, which is relatively high. It follows the theory put forward by

(Soekidjo Notoadmojo, 2003:128, dalam Kamal, 2017) that a person performs a behavior or action due to knowledge and attitudes.

4. CONCLUSION

Based on the data analysis that the researchers have put forward, it can be concluded that the level of knowledge of metal factory waste is good. It can be seen that the level of knowledge about metal factory waste that is included in the high category is 83%, the medium category is 39%, and the low category amounted to 18%. Students know about environmental pollution, its impact, and overcoming or preventing metal factory waste pollution. The perception of metal factory waste is already good. The data analysis results show that the level of perception of metal factory waste that is included in the high category is 73%, the medium category is 27%, and the low category is 15%. Environmental care attitude shows that respondents are trying to understand the importance of protecting the environment, namely trying to invite other people around to protect and preserve the environment directly or in writing. The results of the third study indicate that in the attitude of caring for the environment regarding metal factory waste, 76% in the high category, 29% in the medium category, and 16% in the low category. Based on the calculation results of the Mann-Whitney test, the value of Asymp.Sig. (2-tailed) of 0.000 less than 0.05 where the hypothesis is accepted. Therefore, it can be said that there is a relationship between knowledge, perception, and attitude of caring for the environment.

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